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Series

man and food

the lost equation?

C. Lester Walker and Blair Bolles

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MAN AND FOOD
The Lost Equation?

by C. Lester Walker

1. The Need for Balance

One of the first Americans to suspect that man might some day be in trouble because of his numbers on the earth was Benjamin Franklin. Twenty-five years before the Revolution, Franklin set out his worries in a quaint document called *Observations Concerning the Increase of Mankind and the Peopling of Countries.*

He observed that "there is no bound to the prolific nature of plants or animals but their crowding and interfering with each other's means of subsistence" and pointed out that 80,000 Englishmen in North America had increased in just a few generations to a million.

Another founding father with the same worry was Jefferson. He dreaded the troubles the United States would have when there would be too many Americans.

Writing to Madison in 1787 he expressed himself on the matter in effective if rather rhetorical language. "When we get piled one upon another . . ." he said, "we shall become corrupt, as in Europe, and go to eating one another as they do there."

Such observations, coming from two citizens of a practically empty continent, naturally bothered no one. Only a handful of people knew that Franklin and Jefferson had ever spoken about population matters. But in 1798, eleven years after Jefferson's letter to Madison, a population prophet spoke out and was heard all over the world.

This was the English clergyman, Thomas Robert Malthus. In

a book—*An Essay on the Principle of Population as It Affects the Future Improvement of Society*—Malthus predicted trouble and plenty of it because man was overpopulating the earth.

Malthus' argument, reduced to simplest terms, was this: that man's propensity to increase his numbers would surpass, in the course of successive generations, the world's ability to produce more and more food. He claimed, and of course supplied many facts and figures to back his contention, that the world's food supply increased in an arithmetical progression. That is, in a ratio like this: 2, 4, 6, 8, 10. But population, said Malthus, multiplied in geometrical progression, which is much faster, such as: 2, 4, 8, 16, 32.

Population, Malthus calculated, if unchecked, would double itself every twenty-five years. In the same twenty-five years the produce from a given piece of land, he figured, could also be made to double in quantity, by better husbandry and improvements in agricultural methods and knowledge. But that land could not continue to double its output *every* twenty-five years. That is, if its yield were two tons of foodstuffs the first twenty-five years, the yield might be raised to four tons in the next quarter century, but in the following twenty-five years the yield could not be increased to eight tons, which would mean quadrupling the two-ton crop it first produced. By that time, however—and here was the crucial point—the number of people which the land supported when it raised two tons of food would have quadrupled by their own breeding.

Suppose two persons got their entire sustenance from the piece of land in the first twenty-five years. In the next twenty-five their numbers would double (the geometrical progression of human increase) and in the following twenty-five years they would double again—to eight persons. The net result at this point, Malthus believed, would be four times as many people and far less than four times as much food.

"Isn't it obvious," Malthus asked in effect, "that before long

there will be too many people, not enough food, and increasing misery and hardship as a result for the sons of man?"

MALTHUS IS SCORNED

For a while Malthus' book made a tremendous impression on thoughtful people all over the world. Then, after some years, critics began to laugh at it. The book's calculations on the possible increase in man's food supply suddenly seemed all wrong. For Europe in the middle of the nineteenth century now had more food than ever before in its history. Didn't this disprove all the gloomy prophet's population theories?

No one—or almost no one—took into account that Europe just then was cashing in on an agricultural revolution. New methods of farming, the first in western continental Europe since the fall of Rome, had come in. They were based upon the discovery, made during the previous century, of the principle of crop rotation. Lands which for centuries had been farmed in the cycle of spring grain, winter grain, and lying fallow now were planted to a succession of turnips, clover, and grain. The clover put nitrogen into the land, and its roots brought minerals to the surface by breaking up the soil. The turnips were fed to livestock, which increased in numbers and in turn increased the supply of animal manure for the fields. Wheat lands in England, for instance, which had yielded about ten bushels to the acre as long as man could remember, now yielded twenty bushels. This, of course, doubled the domestic supply.

Meanwhile, the effects of the Industrial Revolution and of the great western emigrations began to be felt. New machines, new markets, and new modes of transportation stimulated or helped make possible increased production of foodstuffs. Thousands of people left Europe for North and South America, resulting in reduction of population pressures at home. This, of course, meant more food per person in Europe. And in addition in the New World, new and rich lands were rapidly put to the plow. Un-

dreamed of supplies of grain began to pour into Europe. For the first time in history almost everyone, it now seemed, had enough to eat.

This happy state almost completely disposed of prophet Malthus. It wasn't long before his population theories were discredited and generally forgotten.

MALTHUS–RIGHT AFTER ALL?

Today, however, some observers of the world's woes are beginning to think that perhaps Malthus, like Destry, rides again.

Some of the English clergyman's calculations (those on the increase of the means of subsistence, for instance) were not absolutely accurate, as we know today in the light of subsequent events. But his basic conception of a continual tug-of-war between the supply of food from the world's limited amount of cultivable land and the upsurge of increasing population was, and still is, one of the great contributions to the thinking of modern times. The importance of Malthus is seen in the fact that today some of the population prophets believe that the world may now be in danger of becoming overpopulated–in the foreseeable future.

For it is evident to anyone looking at the hungry peoples of the world today, say these modern prophets, that something like a race is on, a grim and harrowing race, between the number of people that inhabit the earth and the amount of the world's food supply. Both are increasing–food and people. But both must be kept in balance. For as food falls behind in the race, the world's already ample store of troubles multiplies beyond measure.

Who are these prophets? They are the scientists, specialists, and experts who have been studying human welfare problems for years: the economists, geographers, nutritionists, ecological engineers, conservationists, and demographers. Some of them, especially the demographers who are the *population* experts par excellence, the specialists in the facts and the meanings of population changes, work on the staffs of foundations devoted entirely

to the scientific study of population matters. Three such foundations which are leaders in the field are: the Scripps Foundation for Population Research, in Miami, Ohio; the Population Reference Bureau, in Washington; and the Office of Population Research of the School of Advanced Studies at Princeton.

The work of all these population experts presents a picture which must be of concern to every American. Suppose, therefore, we take a look at it. Let's see what the population-versus-food struggle has been like in the past, what it is like today, and what is probably going to happen in the future, both in this country and in the world at large, in terms of numbers of people and the amounts of food which they must have to live.

2. The World's Millions

"Man walked with hunger through all his early history," Maj. Gen. Frederick Osborn, a demographer now serving on the U.S. Mission to the United Nations, has said.

By this he meant something which perhaps few Americans have realized—that our ancestors, since they first walked the earth, have pretty generally never had enough to eat. Plenty was the exception rather than the rule down through the ages. Famines were frequent and inescapable. China is said to have had 1,800 recorded famines going back to 108 B.C.; and in England between the years 1200 and 1600 there were seven famines every century. England, until the nineteenth century, existed on what we would call today an "Asiatic" standard of living, so scanty was the available food. Ireland was on the verge of starvation much of the time. Indeed, it can be safely said that before the time of Columbus want was universal. The vast majority of mankind was hungry most of the time everywhere.

What effect did this condition have on population? Naturally it kept man's numbers down. With inadequate food came low physical resistance to pestilence and disease. Millions who escaped outright starvation succumbed to these. Then war—which often wiped out half a nation—took its toll. And as an aftermath of war the least well-fed, that is, the weakest, when the crops had been pillaged or burned, died off. As a consequence man's death rate was so high that it rapidly balanced his births. Man's numbers on the globe, population authorities believe, were static for centuries.

"Until the middle of the seventeenth century," according to Dr. Frank Notestein of the Office of Population Research, "there were probably never more than 500 million people living at the same time."

POPULATION TURNS THE CORNER

Then, somewhere about the middle of the seventeenth century, the picture began to change. The population of the world started to increase, and it kept on increasing steadily.

There were a number of causes for this growth. Fewer people died of plague and pestilence. Wars became less savage and destructive of life. Not so many people died of malnutrition or starvation because the new agriculture in Europe and the new lands in the Americas produced more and more food.

The population increased not only steadily but rapidly. Man was to multiply in the years ahead as he had never done before. By 1800 he had doubled his numbers, and since then he has doubled them again. Europe increased its peoples five fold. If the fantastic rate of growth of the past century had existed throughout the Christian Era, it is calculated that today the continent of Europe would hold more than one person per square yard of its land area.

That gives you a picture of man's upsurge in numbers over the past 300 years. But what is the trend today?

The answer is: "In the same direction."

The population of the world is now increasing, according to a study by the U.S. State Department, at the rate of 21 million people every year. That is a *net* increase: all the births minus all the deaths—and you have a surplus of 21 million new people annually.

This rate of increase, if continued, would give the world at least 500 million more people twenty-five years hence than it has today, when the world total is about 2.5 billion. A hundred years hence, if the rate of increase is unchecked, the world total, most population experts believe, will run to 4.5 billion.

Of course, there is always a possibility that the present rate of increase may be checked in future years by forces which we cannot foresee today but which we may speculate upon. Some of these prospects are far from pleasant. Despite the world's skill in medical science and public health, some great plague might arise and sweep off millions—like the Black Death of fourteenth century Europe, or like, in a lesser way, the virulent influenza epidemic which followed World War I in the United States and elsewhere. A succession of years of drought over most of the world could produce famines of a size and severity which would starve to death great hordes of people. And the potential of the atomic bomb as a decimator of populations is looked upon with an apprehensive eye by many a population expert, both in this country and abroad. Lowered birth rates—deliberately and consciously lowered, that is—are another possible future check. But these are possibilities, not something to count upon.

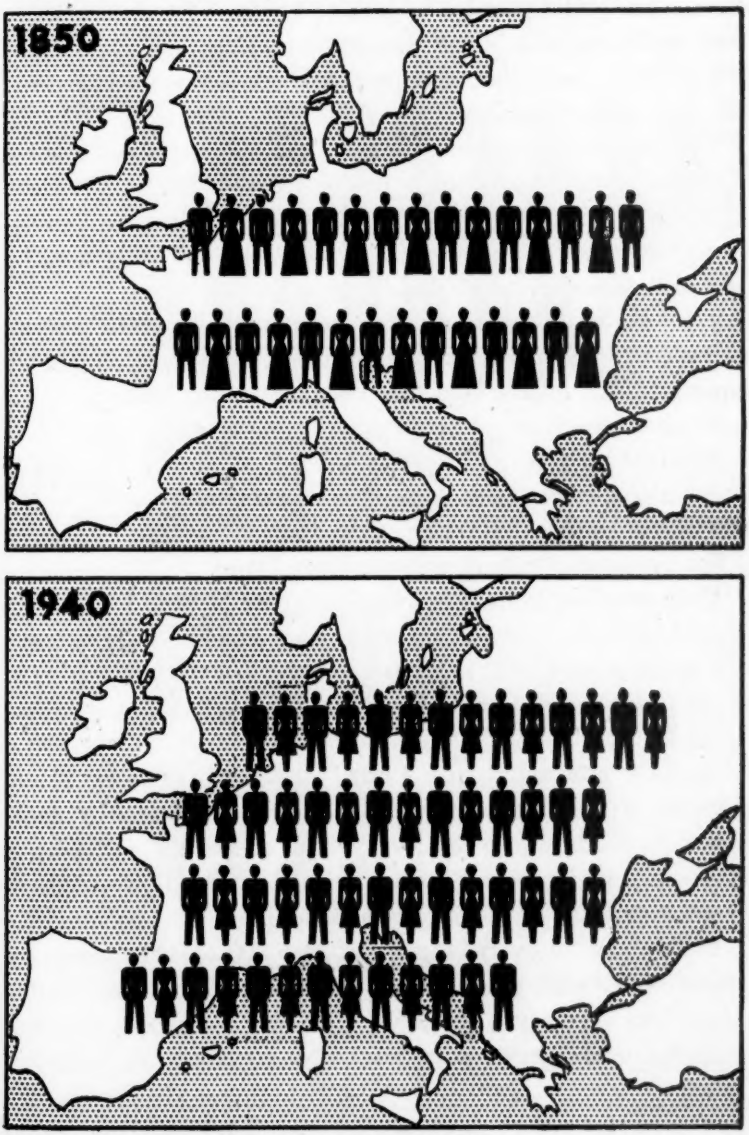
"The world doubled its numbers in the last ninety years," say the population people. "It is not inconceivable, certainly, that it could do it again."

Will such an overwhelming increase of numbers contribute to a brighter or darker future for the world? Will such an increase lead to prosperity, productiveness, and peace? Or will it mean the onset of wars of conquest brought on by long years, decades, and centuries of a continually losing struggle to maintain adequate living standards for ever-increasing numbers? Will it mean, perhaps, a future for the world in which *the* problem of mankind will be nothing more nor less than the need to keep one step ahead of ever-threatening want and poverty? It is the possibility of the latter—a long-drawn battle in which victory is by no means assured—which especially troubles the minds of many students of world population problems today.

WHERE WILL THE NEW BILLIONS COME FROM?

Most Americans know that the United States now has 148 million people, that the Census Bureau predicts about 166 million

GROWTH OF EUROPE'S POPULATION



EACH FIGURE REPRESENTS 10 MILLION PERSONS

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by 1975, and that thereafter there is a fair probability our own numbers may decline. "Down to as low as 151 million," the Census Bureau has said. Presented with these figures, a lot of Americans, with understandable skepticism, will very likely ask, "But where are all those two billion new people which the world expects in the next century going to come from?"

The population prophets will show you by citing what is going on in the world's most densely peopled areas today.

There are more than 400 million persons in Europe. Twenty-five years hence there will be, it is estimated, 490 million, exclusive of Russia.

Japan's 75 million are multiplying at the rate of 10 millions every decade. (Japan already has thirteen times more people per square mile of tillable land than does the United States.)

Smaller countries are following suit. Mexico's population jumped 60 per cent in the past thirty-five years. The Philippines are doubling every thirty. Java—so crowded it now has 800 people per square mile (the United States has 45)—expects to reach 1,400 per square mile in one more generation.

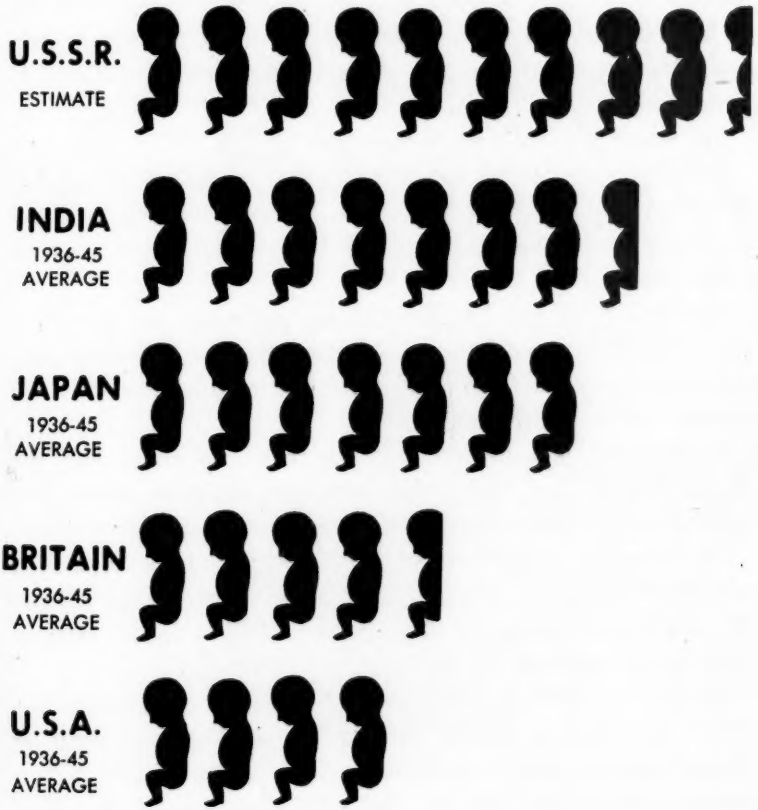
Then consider India. From the beginning of World War II to April 1945, India increased its numbers by 30 million. Today India has approximately 420 millions and is adding 100 million more every twenty years. In a century it may have a total of one billion souls.

"India is growing at such a rate," declares Guy Irving Burch, director of the Population Reference Bureau, "that if it could lower its death rate to the level of that of the United States or England, with its present birth rate India would fill five earths as large as ours and as full as ours is today in one single century."

China may be overtaking India. Her 400 to 450 million are expected to double in ninety-odd years. Some Chinese population authorities say maybe in sixty years. Another expert says that doubling could occur, given the right conditions, in thirty-five years.

SOURCES OF WORLD'S NEW MILLIONS

BIRTHS PER THOUSAND



EACH SYMBOL REPRESENTS 4 BIRTHS

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And Russia is growing so fast that it is expected to have within the next two and a half decades more than 250 million citizens.

From these facts it is obvious, of course, that most of those two billion new people are going to come from Europe and Asia. And one population prophet goes so far as to predict that in fifty-two

years all of Asia may have as many people as the whole world has today.

ARE 4.5 BILLION TOO MANY?

When told that the world may have 4.5 billion people living on it a hundred years hence, the reaction of the average American, who may never have thought about population problems, is quite likely to be:

"So what? It's still a big world, isn't it?"

Possibly someone else has told him that the total land area of the globe is about 35.7 billion acres. He compares this with the number of human beings to be, and it seems like ample room for everybody.

Certainly there will be plenty of air to breathe and plenty of space in which to live and move around. But the important consideration is not the total of land area but the amount which will produce man's clothing and food.

Mountains, bogs, deserts, and ice make up about half the earth's land surface. And of the remainder, according to the best authorities, only about four billion acres are fit for cultivation.

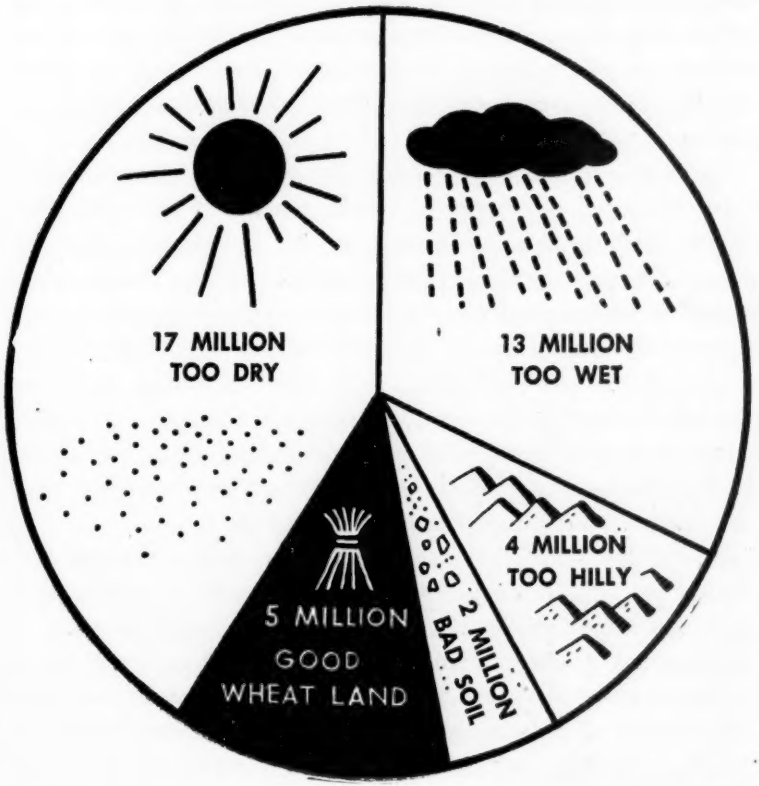
This seems a preposterously small fraction of the total land area of the globe, doesn't it? And only this niggardly portion can be used to grow crops for clothing and food? It doesn't seem to make either reason or sense.

But it is a fact, all the same, and here the explanation lies. More than land is needed to grow crops. The land must be blessed with a certain combination of fertility, climate, topography, sunlight, and rainfall. And only about one-fourteenth of the earth's land surface possesses the proper combination of all these requirements.

Some lands have everything, but their temperature is too low. Some are so steeply sloping that, if they are planted, they wash away. Others may fail to qualify because they have either too little or too much rainfall.

MOST LAND IS BAD LAND

OF 41 MILLION SQUARE MILES IN TEMPERATE REGION



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You can see an impressive and concrete example of how inexorable are these requirements and how a lack of any one of them scales down the usability of land if you will look at the case of the lands which are suitable for growing wheat. Some years ago Dr. O. E. Baker, a geographer of the United States Department of Agriculture, wanted to determine the total acreage available for wheat culture in the world. He therefore began with a known

area of 41 million square miles which has a correct wheat growing temperature and altitude. From this he had to subtract 17 million square miles which were too dry for wheat. Then 13 million which were too wet. Then four million which were too hilly for proper cultivation. Two million more square miles came off as soil unfit for wheat, leaving of the original 41 million square miles only *five* million with the right combination of elements for wheat raising.

This estimate was made in 1925, and since then plant scientists have developed new types of wheat, some of which will grow farther north or on acres formerly too dry for wheat production. Some addition to possible wheat raising lands has therefore occurred in the intervening years. But there have been some cancellations also. Certain areas of the earth have been growing steadily more arid, like parts of Central Asia which have been drying up for hundreds of years. Sections of North China, for instance, which in the 1800's supplied wheat and other grains to Peiping have in the past twenty-five years arrived at the point where they are unable even to feed the local population.

And of the five million square miles having the right combination of elements for wheat raising, as estimated in the original calculation by Dr. Baker, only part can actually be used to grow wheat, because man must have more than bread alone. Cotton, for instance, which clothes most of the world's millions, takes a vast slice from the land on which wheat production is possible. Actually, it is estimated that not more than one-tenth of the available five million square miles has been used for wheat growing.

ARE THE ARABLE ACRES ENOUGH?

But with his total of four billion acres of arable land—including lands suitable for other crops besides wheat—does man, nevertheless, have enough? With that amount can he feed and clothe himself, even when his numbers greatly increase?

For any answer to this question we must turn to the calculations of the nutritionists. Dr. Hugh M. Bennett, chief of the Soil Conservation Service of the U.S. Department of Agriculture, estimates that it takes, world-over, an average of 2.5 acres to clothe a person and provide him with a minimum adequate diet. If we divide the four billion acres of land by the 2.5 billion people now in the world, we find that we have 1.6 acres per individual. If the nutritionists are right (and most population experts think they are), then it looks as though the human race may already be running short of land.

Of course, the figure of 2.5 acres per person set by the nutritionists is a somewhat theoretical quantity. It represents an ideal: the land necessary to produce a diet which, by nutrition standards, would be just barely enough—or in technical terms, a *minimum adequate diet.*

But such a diet is something which many of the world's millions have never experienced at any time except in their dreams. That is why two-thirds of the population of the world, according to former Secretary of Agriculture Clinton Anderson, was chronically undernourished even before the late war and why 20 to 30 millions now die every year from causes attributable to lack of proper food. It is estimated that in China alone today, even when there is no famine, two million people annually succumb to starvation.

These are the signs which show to what extent we are losing the food and population race. But can't we find more land beyond the four-billion-acre total? Few of the experts think there is any hope of adding much to the world's arable lands.

"There are no undiscovered reserves of productive land of any substantial area," says Dr. Bennett.

And two population prophets, Frank A. Pearson and Floyd A. Harper, in their study *The World's Hunger,* state flatly:

"The requirements of nature for food production are so rigid that thus far man has been able to use only a small proportion

of the earth's land surface and has been defeated in most of his attempts to extend his boundaries . . . Expansion of the world's agriculture beyond the area now being used is a hazardous undertaking . . . There are no large areas of new land to be brought into cultivation."

Even the United States, which we often think of as having more good land than we can use, is, apparently, beginning to feel the pinch. Dr. Bennett recently declared:

"There is not enough good land left in the United States. Actually we need more good land for crops now."

All this is the reason why the food problem of the future, with the race of man increasing by leaps and bounds, is going to be such a tough one to solve.

3. The Quest for Food

When confronted with a tough problem, most Americans react by wanting to lick it. In this case we are apt to declare: "We'll whip this problem somehow. There are ways to produce more food."

Of course there are. And in the years ahead many of the ways, both old and new, will be tried. In prospect many of them look encouraging. But whether they will produce enough food *fast* enough to keep pace with the growth of population is the crucial question.

No one, of course, is so omniscient as to know positively the answer. But anyone can get some idea of the probable answer if he will question the food-and-population experts on the chief ways—about a dozen in all—most often suggested for increasing the world's future food supply.

What are these ways and what do they promise?

One of the ways most often suggested is irrigation. Think of the vast arid and semi-arid areas of the earth. Cannot engineers build dams, flow water into these regions, and produce thereby tremendous tracts which can be used for production of man's future food?

Irrigation projects are certainly going to help in the food production problem, the experts will tell you, but not as much as Americans tend to imagine. The world is now crisscrossed by irrigation ditches to a surprising degree. About one-fourth of the population already lives on crops raised by irrigation; and in some

countries, such as China where about half the crop land has been irrigated, this method has been developed nearly to the limit.

And much irrigated land has turned out to be an uneconomic venture. For various reasons it has not met the cost of the original investment. Sometimes this has been due to excessive and speculative values adhering to the original lands, making them too costly in the beginning. Sometimes high costs in the initial dam building and ditch digging and, later, unforeseen high costs of maintenance and operation have made irrigation projects financial failures. Or as one authority has expressed it:

"The annual costs of maintenance and operation are continuous and large and cannot be written off. For most projects the annual cost of maintenance is all the farmers can afford to pay. Much of the land that has been irrigated has not paid the original cost and gives no promise of doing so."

Hence, all factors considered, many population prophets fear that, although irrigation offers man and his great problem some hope for the future, the hope is not an extremely rosy one.

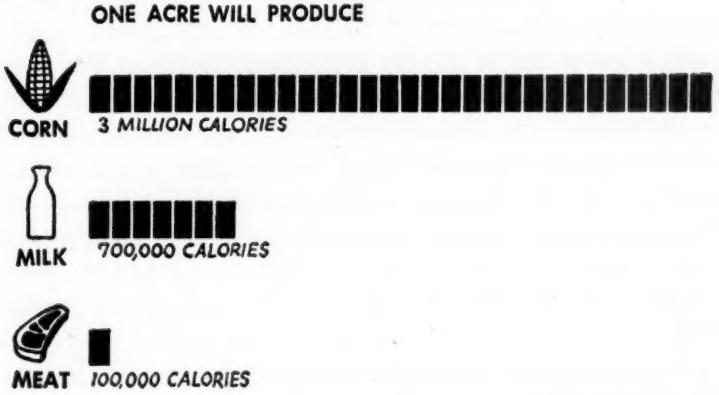
NEW TYPE CROPS, NEW TYPE SEEDS

Another way to boost crop yields, one which is sure to be pushed hard in the future, is by use of so-called "improved" crops and new breeds of food-producing seeds.

We have all heard of hybrid corn, produced by scientific plant breeding and yielding as much as 20 per cent more than the old style corn. New blight-resistant potatoes have doubled the total tonnage yielded by older types while using but one-half the acreage. A wheat called "Turkey Red" was brought to America from Western Europe and "improved" so that it would grow on more arid lands. Another wheat seed—called "Marquis"—has been developed in Canada, increasing wheat lands there by thousands of acres.

"Turkey Red" and "Marquis" are possibly the most hopeful examples of all, because wheat is the grain crop of the world upon which man most heavily depends. Human beings, the world

WHY MEAT IS A LUXURY FOOD



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over, eat very little meat and dairy products in proportion to other foods. Meat makes up only about 2.7 per cent of the world's food. Milk amounts to only .3 per cent more. But the grains—wheat, rye, barley, rice, corn—account for 82 per cent.

Not from choice, however, is man's diet so preponderantly composed of cereals. Most people would rather eat a juicy steak than a bowl of rice or barley. But meat in terms of land is an unproductive food to raise. Meat, world-over, needs twenty times the land cereals do. One acre of the midwestern American corn belt, if used to grow maize, will produce three million calories of food. But if it is used to raise beef, it will provide only 100,000 calories.

Often land unsuitable for grain production will supply forage for livestock—like the sheep-raising areas of Australia—and there are regions of the world where more meat-producing animals could be pastured. The plains of Mongolia are an example. But these lands, if they were grazed by much bigger herds, would not very materially alter the worldwide meat picture. Meat would still be in limited supply, still a luxury that the hungry millions of the world could never afford. Even in the United States the cost of a pound of dry foodstuff from animal products usually

runs to at least three times that of vegetable food. The discrepancy is even greater in Asiatic countries where almost no meat is eaten by the masses. And for the poorer millions of new people who are swelling the world's population every year, the discrepancy obviously would be prohibitive.

With these facts in mind, anyone can appreciate the importance of new grains which will grow where grain never flourished before or which will bring us higher and higher yields. However, the development of such seeds takes time. The plant biologists cannot produce them over the weekend, the food-and-population experts warn. Nor can they be absolutely sure of ever producing them.

Man, therefore, as long as he permits his numbers to rise so rapidly, had better not be too confident that such new grains will arrive in time to provide an adequate solution for his biggest problem.

WHAT CAN SOIL CONSERVATION DO?

You will hear it said sometimes that if a perfect program of soil conservation could be put into effect all over the world, it would surpass all other ways of assuring a larger food supply.

Such a program would check loss of the world's crop land to wind and water erosion, and undoubtedly it could have a very favorable effect on the world's over-all food supply. Conservation can do wonderful things for the land if it is applied in time and over a sufficient span of years. The erosion situation in some parts of the United States and the beneficial effects which conservation practices have had on eroded American land offer some interesting and enlightening examples of this.

For an illustration of what the erosion situation can be in conservation-neglected areas, look for a moment at certain lands in Indiana and adjacent states. There are about 75 million acres (in Indiana, Ohio, Pennsylvania, Kentucky, and West Virginia) which are representative of the average type of crop land usually put to corn in those states. Many of these acres for long years

past have been subjected to continuous cropping for corn alone, regardless of the erosion which this kind of farming has allowed.

These acres were originally grasslands. As such, their erosion loss, the agricultural scientists know, was about .028 of a ton of soil per acre per year. As corn lands, what do you think their erosion rate might be? The answer is an almost unbelievable one. On many of these corn lands the soil loss annually was 99.3 tons per acre. In other words, the erosion situation was this: plowing the grass and using the land for a clean-tilled crop increased the loss by erosion 3,546 times!

What happens to crops on such land? Here are actual figures from actual Indiana fields. Land in a protected stretch with a foot of topsoil left on it yielded 69.5 bushels of corn per acre. Where only two inches of topsoil remained unwashed away, the yield dropped to 30 bushels. But where most of the topsoil was gone, the corn produced never averaged more than 19.8 bushels per acre.

A sad plight for any land to be in, certainly. But it is possible for conservation experts to come into an area where lands are in such a condition and, given time and cooperation from the farm owners, alter the picture materially. The files of the United States Soil Conservation Service are bulging with cases where lands, by application of known principles of soil salvaging, have not only stopped their breakneck erosion but have also actually "come back"—produced bountiful crops again.

Per acre yields on conservation-treated lands are sometimes increased as much as 20 per cent and more. The Department of Agriculture cites the records of 9,000 farmers who reported from their own conservation experience an average increase in per acre yields of various crops equal to 35 per cent. Which well indicates what conservation measures (proper contour plowing, cover crops, water course management, and dozens other such practices), if given a chance, can often do.

From this one might conclude that the United States is superlatively intelligent and wise in conservation matters. Actually it is

far from what it should be. The amount of good land forever lost, and now being lost, to erosion in this country presents a rather dismal picture. Dr. Bennett declares that we have ruined more good land in less time than any nation in recorded history. One-fifth of our lands are wrecked beyond repair. This year, now, we are losing to erosion the equivalent of 73,000 fine forty-acre farms. Our total topsoil loss is estimated at one-half million acres annually. And this when only a few inches of topsoil is all that ever stands between any people and starvation.

THE WORLD PICTURE

What, therefore, are the chances of a worldwide conservation program functioning successfully, if not now, in the foreseeable future?

Some of the food-and-population prophets believe these chances are very slim. Today the races of the world, they say, are squandering their best farmlands on a scale unparalleled in world history. And this destruction is not likely to be universally ended by a plan based on calm foresight and cool reasoning. Not when land is being wasted because ever-increasing population pressures in so many regions demand that *some* kind of crop—no matter how much it exhausts the soil or facilitates erosion—be grown.

Erosionwise, the rest of the world actually is in no better state than this country. It is quite possible that world erosion conditions are worse than they are here. G. V. Jacks and R. O. Whyte, two conservationists, assert in a study of worldwide soil conditions called *Vanishing Lands,* that man's land mismanagement in recent times has created nearly a million square miles of new deserts. Much greater areas, they add, are fast becoming deserts. On continent after continent the prospect shows little difference. Erosion in Africa is said to be worse than in the United States. And the same goes for Australia. It is reported especially bad in Asiatic countries like India, because of overcultivation forced by excessive rises in population.

Reports state that even the vast Eurasian grasslands and the broad wheat-producing black soil areas of Russia show extensive erosion injury now. Moscow recently announced a fifteen-year reclamation and development project covering nearly 300 million acres of Russia's richest land, stretching from the Ukraine to the North Caucasus and the center of the Soviet Union. It involves the planting of great forest belts totalling more than 14 million acres to check erosion and combat the droughts which periodically hamper Russian agriculture. Such a program, if successfully completed, promises some hope for the rising population of the Soviet Union. But it also indicates, as some authorities have contended, that past Soviet farming has failed to follow the best conservation methods and that widespread erosion now presents the same problem for the Kremlin's planners as it does elsewhere.

In South America, which so many North Americans picture as an unspoiled region, soil conditions are so serious that one expert, William Vogt, chief of the Conservation Section of the Pan-American Union, speaks of a "continent sliding to ruin."

Another authority, Ward Shepard, in his study *Food or Famine: the Challenge of Erosion,* sums up the situation, without glossing over its seriousness, this way:

"Despite the brilliant advances in agricultural science, the productivity of the world's soils in output per unit is slowly diminishing. Mankind is fighting a slow retreat before the gathering forces of famine. An ominously and swiftly increasing process of soil destruction is undermining the foundations of our shaky civilization. Beginning as the sapping of soil fertility, it ends in what can be described as a new, man-made, cataclysmic geologic era, in which our food-producing soils are being swept into the rivers and the seas. Armed with machinery and industrialism, modern man is devastating the farms, the grasslands, and the forests of the world. In the long evolutionary chain of life, he is the only creature who has achieved the dubious distinction of being able to destroy nature's harmony and fecundity on a cosmic scale."

These conditions obtain because man, by and large throughout

the world, is heedless of the depredations his farming commits upon his lands or is ignorant of them. Or because the intense pressure of population—an ever-mounting number of mouths to feed—forces him to provide for today's hunger and let tomorrow's famine take care of itself. As long as such causes exist, conservation's worldwide role in saving land and increasing food production will take a long, long time before arriving at its maximum effectiveness. And the most perfect system of conservation measures will never give us totally new arable lands. It will merely keep the productive lands the world already has or bring back some of the lands which have been lost.

"LET'S CUT DOWN THE JUNGLES"

Still another idea for larger food supplies suggests that we turn to the tropics.

This is an alluring suggestion. About a billion tropical acres have never been touched for food production. And, as anyone knows, farmers in hot climates often plant and harvest three crops a year. If the jungles of the Amazon, of New Guinea, of the Congo could be deforested and turned into farmlands, think what a wealth of food they might yield.

It is not, however, quite that simple. Actually, the agronomists will tell you, these jungle lands are probably not worth much as food raisers. Most of them have too much rainfall—seven feet a year in places. Let the heavy protection of the forest be removed and this flood of rain pours through the soil washing away indispensable minerals in a process the experts call "leaching." Then the tropical sun burns the surface, oxidizing the humus and other organic matter. This process proceeds so fast that one geographer has described it as similar to "burning magnesium powder." Obviously, such conditions of soil and climate promise no bountiful new food-producing crops.

It is true, however, that some tropical soils are highly productive. But these are in special areas. An example is Java. Here the land is of recent volcanic origin, highly fertile, and not yet leached

out. But such regions are unfortunately of greatly limited extent.

INTENSIVE FARMING, INTENSIVE FERTILIZING

Two other proposals often heard are to fertilize intensively and farm intensively on our food-producing fields.

Chemical fertilizers—phosphorus, potash, and nitrogen mixtures—will sometimes increase crop yields several fold. There is a limit, however, beyond which they cannot raise soil fertility. Once these fertilizers reach their ceiling in providing soil with needed minerals, a given piece of land will not burgeon forth with ampler crops no matter how many chemicals are added.

More important than chemical fertilizers to most of mankind, and more used, are the fertilizers composed of animal and human manure. Of the latter only about half the available supply (chiefly in Asia) is ever utilized. The world gets rid of the rest for sanitary reasons and loses it forever.

This half, however, presents a potential future supply of great importance. It will be used and will increase the world's food supplies, authorities believe, when the regions where it is now wasted become heavily populated in proportion to their food supply.

Animal manures? We are told that these promise less for the future. In densely populated lands they are already utilized to the limit. (In China they represent four-fifths of all fertilizers.) Nor is there any way to increase them except by the increase of livestock. And this would require more acres turned over to pasturage or production of fodder. Inevitably most of this pasture land would be subtracted from fields now in grain. Such a transfer is highly improbable in a world where there is already too little grain to feed too many hungry mouths.

Another type of fertilizer runs into the same dilemma. "Green manure"—especially plants like clover and alfalfa—plowed under adds nitrogen to the soil. But acreage growing green manure is acreage for the time being not raising food for man—a lapse which the world's hungry can ill endure.

Green manure is particularly important in lands which have a long growing season, one more than ample for the growth of the chief crop. Then, in the left-over growing season, green manure crops can be planted with time enough to sprout, mature, and be plowed under. In northern climates the season is often only long enough to bring to harvest the principal crop planting. Winter sets in before a crop of green manure can be fully grown.

In some countries even where a long growing season is found, however, often little green manure is grown. China is an example of this. Much of its land is in the long-season belt; much of it raises three crops a year. But little green manure is planted and plowed under by the Chinese. For them it is more pressing to plant another edible crop and provide for their hungry millions. Undoubtedly on the lands on which it is used green manure will increase the crops which follow such plantings; but whether over the long run this land will actually feed more people is a questionable point, according to some experts.

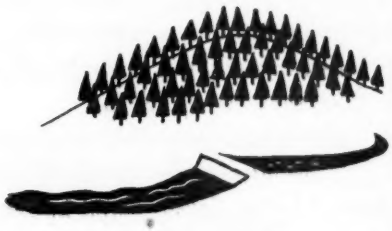
HARDER WORK, BIGGER YIELDS?

Intensive farming basically means applying more labor to the land so that on a given area more people are used to plow, cultivate, and care for the growing crops. It is an old and proven way to increase yields, especially characteristic of farms in Asia and Europe. France, Germany, and Italy use more people, more handwork, and more meticulous care in cultivating their fields than we do and thus outproduce, acre for acre, the farms of the United States.

But in many food-growing regions of the earth the increased labor of intensive farming would have only doubtful advantages. Consider the vast grain growing plains of the United States, now farmed by relatively few workers under a highly mechanized system. Such land is naturally suited for this kind of agriculture. Cut up these vast wheat lands into small plots, farm them intensively with greater numbers of workers, and yields per acre might increase. But yields per worker would fall, and the trend of the

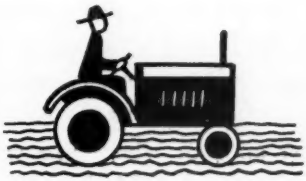
POSSIBLE WAYS OF INCREASING WORLD'S FOOD SUPPLY

IRRIGATION



CHECKING EROSION

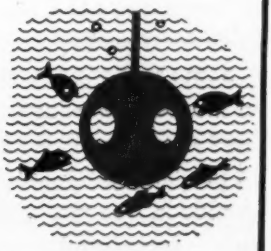
NEW SEEDS AND FERTILIZER



USE OF FARM MACHINERY

HYDROPONICS

PEST CONTROL



SEA FOOD

GRAPHIC ASSOCIATES

American economy toward specialization and mass production would be reversed. There would be smaller farm surpluses to send to the cities—because the additional people on the land would consume a greater proportion of their own produce. The income of individual farmers would fall; the consumption of non-agricultural products, automobiles, radios, telephones, etc., would be forced down; and living standards—which include other items besides food—would drop.

Some experts even believe that yields per acre would decrease. Why? Because, in the words of one authority, "increased applications of human labor would be accompanied by a decrease in the use of machinery." On the great, rolling plains now highly mechanized, the machine is not only more efficient in terms of man hours but in terms of most efficient land use, in preparing and cultivating the soil and in harvesting the crops.

In countries where land is *already* intensively farmed, the practice cannot be stepped up very much either—not without running into the law of diminishing returns. In Asia, for instance, more people toiling on each acre of land would boost production—but not enough to make the effort worthwhile. Ten Chinese working upon an acre where five worked before would nowhere near increase food yields in a two-to-one ratio. The additional yield of food (there would, of course, be some) would not even supply enough for the additional laborers. This would mean, of course, for everyone a little less food per individual, even though the grand total yields, thanks to the more intensive cultivation, had been increased.

Some authorities who are skeptical about the long-term benefits of intensive farming for the world as a whole point out that such land use, since it involves more labor, often means a higher cost of production. Doubling the labor does not usually mean a crop double in quantity and value. The higher unit production cost in turn can mean a lower standard of living. Irrigation and intensive farming, they point out, brought about exactly this regrettable result in Egypt.

WHAT HELP FROM FARM MACHINERY?

When Malthus was discredited, many of his opponents failed to see the relation of increased production of food *per man* and increased production *per unit of area.*

Today some persons expect modern agricultural machinery to come into worldwide use as the savior of hungry millions. These observers stand in somewhat the same position as many of Malthus' detractors.

If machinery is used in raising food, the significant increase in yield is not per unit of land but per unit of man worker. Machinery reduces the number of hands and the number of work hours needed to produce a crop. But the most miraculous of modern machinery will not, as one agricultural expert puts it, "overcome the most important conditions limiting yields, the natural fertility of the soil and climatic conditions."

In some lands, the food-and-population prophets sometimes point out, mechanization would be an actual liability. In small fields and in hilly regions—such as those of Java and Japan—it cannot be used efficiently. Often, if tried, it actually cuts down crop yields.

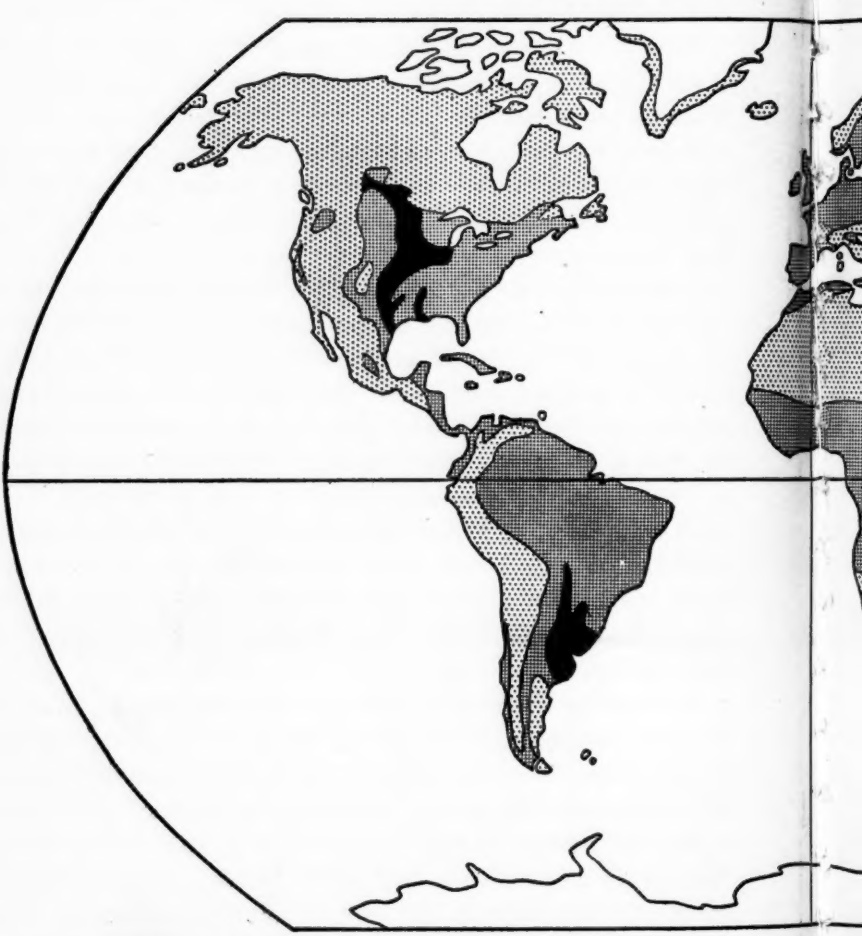
Nor does the machine in agriculture hold out promise, as far as one can see ahead, for the nations which are already overpopulated. In these countries, where living standards and daily wages are abyssmally low, use of machinery to produce food, some authorities believe, is almost impossible. In such lands, as one expert says, the problem is "to improve the hoe." In sum, although machinery can increase the crop production of man to some extent—on the lands naturally suited to its use—it does not offer the great solution some people think it does.

OTHER DEVICES

These are some of the methods (the ones most often suggested) for solving man's food-and-numbers problem by forcing more sustenance out of the land. There are other stratagems, however.

One of these is to check the great losses which the world food

THE WORLD'S FARMLANDS



RICH FARMLANDS, HIGH NATURAL FERTILITY.

OTHER ARABLE LAND, LOW OR MODERATE INCLUDING SOME GOOD GRAZING LAND

SMALLEST AREAS SHOWN ABOUT 3000 SQUARE MILES, BASED ON FAO DATA

supply suffers yearly from rodents, insects, and other pests. It has been estimated that approximately 10 per cent of the world's crops are destroyed by rats and other vermin. In terms of money the annual loss in the United States is calculated at 20 million

OR MODERATE FERTILITY, RAZING LANDS

LAND OF LITTLE OR NO PRODUCTIVITY, BUT INCLUDING GRAZING AND FOREST LANDS

ATA

GRAPHIC ASSOCIATES

dollars. Better protection of food during harvest and storage—and a vigorous war on rodents and similar pests would certainly be one way to augment the food which actually reaches man's dinner table.

Another approach to the food-and-population problem is that of "sharing." That is, dividing up more equally what food the world has. Some nations eat too much while others starve. Why shouldn't the have-nations, this proposal suggests, cut down or alter their diet so as to provide more food for the have-nots? And why couldn't this be done—perhaps through some organization like the United Nations—on a worldwide scale?

Any such scheme appeals strongly to the humanitarian instincts in man and is certainly worth considering. It is therefore pertinent to examine some of the practical consequences of such a plan.

Dividing up the food more equably on any world scale would almost certainly mean that peoples who now enjoy a high standard of living and eating would one day find themselves sliding down toward a lower one. At the bottom of the depression the most meanly fed American ate an average of 120 pounds of meat a year. Under an "all share" plan this figure would plummet to 50 pounds.

The food production of the world in 1948, it has been calculated, could feed only about half of today's world population on a North American standard of three meals of good quality a day. On the other hand, if the whole world put itself on an "Asiatic" standard, the grain production of the United States alone would support half a billion more people than the world now holds.

Dividing up the food on a worldwide scale would not mean better food for all the people, but it would mean the same food for many, better for some, and much poorer food for others. It would not be possible, for instance, to supply much of the world's best foods like meat, eggs, and milk to everyone. Enough of such foods just couldn't be produced.

Animal foods such as these, as stated before, require grain and grasses for production. And to improve the world's diet by feeding more grain to livestock is, as one agricultural expert has put it, just like inviting starvation to come in the door. Remember

that from a given parcel of land man can get 300 calories in corn but only 70 calories in milk.

Speaking of milk, proponents of the sharing plan have expressed the laudable hope that with a more equitable division of food there might some day be a quart of milk daily available to every child in the world. Others have proposed that the goal be a quart for every citizen of the world. Those who disbelieve in the practicality of such plans for sharing the world's food are quick to pile wet blankets on such ideas. They point out that even a quart of milk a day for each American would be a quota extremely difficult to fill. For the world at large, any such program to be successful would need enough grain, or its equivalent, to feed today's entire world population. As one critic says, "there isn't enough pasture land on earth to feed the cows that would produce this ocean of milk."

It has been estimated that if North America and Oceania (Australia, New Zealand, etc.) shared their animal products with Europe, each European would augment his present rations by only one-eighth. Equal sharing the world over would, of course, spread the divisible food even thinner.

So any system of even-Steven division could not appreciably increase the amounts of the more highly prized foods. In fact these foods would, most likely, begin to dwindle and disappear, since man in sharing all would have to divert more and more of his acres to growing the crops with high calory yields, the grains.

The ultimate result would be, it would seem, a diet mainly of cereals for all of the world. Some of the people of the high-living countries might not like this. There is no doubt, however, that the arrangement would keep alive thousands in other lands.

"SCIENCE WILL PULL US OUT"

Presented with the world's admittedly formidable difficulties of raising food—enough and soon enough—for future generations, optimistic Americans sometimes come up with the pronouncement:

"Oh, well, the scientists will figure out a solution. Maybe new places from which to get food. Or totally new ways to grow food. Or maybe they'll actually invent new compounds which will be edible and will sustain life."

One of these "new places" deserves serious consideration. It is the sea. In the future man is going to utilize the oceans as a source of food more than he has ever done before. There is some chance that we may grow edible vegetable foods on the ocean bottom, and it is certain that the haul of fish will be increased considerably.

Oceanographers have already mapped out plans for future fishermen. They claim that improved techniques in taking and handling fish could increase catches many times over. Specifically, they charge that present-day fishing equipment is in the bow-and-arrow age. The nets, their use, and the boats that drag them are inefficient. In the future nets will be constructed so that the frightening of the fish—frequent now—is reduced to a minimum; and fishermen will learn how to herd the fish to the net—by directed underwater lights or by acoustical or electrical sweeps.

Today man's refusal to eat some species of fish causes a waste of food. We also throw back two-thirds of our fish catch for lack of refrigeration facilities. But the fishing trawler of tomorrow, the planners say, will be a floating freezer, capable of handling practically anything that comes aboard. Fish will be filleted and frozen on the spot, oil extracted from the livers, and the refuse turned into fertilizer meal.

The deep ocean (that is, not the "banks" or the "off-shore" areas) is as yet untouched and gives promise of future food supply. Experiments indicate that fifty fathoms down and farther there are vast layers, or shoals, of fish or plankton-like shrimp. Sonic echoes bounce back from them, identical with echoes received from other shoals of fish in deep waters off France. Man can perhaps some day tap these as yet unused sources to augment his food supply.

Another method will be to "farm" fish in cut-off arms of the

sea. Something akin to intensive farming on land, this has already yielded promising results in certain Scottish lochs. There by adding chemicals to the water—sodium phosphate and sodium nitrate—fish have been made to grow three times as fast as they would in the open sea.

Some oceanographers claim that an acre of sea is potentially more productive of food than an acre of land. Agriculturists dispute this, asserting that the best fishing grounds, such as the North Sea, yield nowhere near the amount of an acre of American corn land, for example. The former, dry weight, they claim, is only one pound, while the latter is 2,000 pounds.

Other authorities insist that the productivity of the sea is stringently limited by the need of all plant life for sunshine. This limits the fish population of the seas, since basically all fish life ultimately depends on plant food. Six hundred feet is the depth, roughly, to which adequate sunlight filters down. Hence there is plentiful plant growth probably in only a mere five per cent of the ocean.

Probably great increases in the fish yielded by the sea will occur in the years ahead. But a sobering thought for those who expect ideas from the scientists to crack the food production problem lies in the fact that even so great an increase as eight or ten fold over present catches would hardly enable mankind as a whole to let out his belt much. Fish today constitutes a mere fraction of one per cent of man's total food.

SYNTHETIC FOODS AND SUCH

Hydroponics—growing of plants without soil, in water and dissolved nutrients—is frequently suggested with enthusiasm by the scientifically minded. But so far this interesting development has not given positive proof that it will make an early contribution to the world's bread basket. Dr. Bennett, of the Soil Conservation Service, has said that on any large scale hydroponics would be utterly impractical. The future may show otherwise, but it will probably be a very distant future.

Unpredictable miracles may come from the scientists' test tubes, however. Synthetic foods like the sugar which is already being created from wood is an example. Food yeasts may bring an unsuspected source of proteins. And within the year chemists have announced that they believe they have unlocked the outer door on photosynthesis—the closely guarded secret by which nature takes sunlight, water, and carbon dioxide and, with a growing plant for a factory, manufactures food.

But these aids from science may not produce practical results for many years, for generations, or even for centuries. And time is pressing. As we have seen, the race of man is multiplying its numbers as never before. And it is clear from all the signs that these numbers are at the moment outrunning food-producing capacity. Since this is the situation, perhaps it behooves us to consider in our next section the question:

"What effect is this situation probably going to have on the lives of nations and individuals, in relation to such things as free government, economic welfare, and the probability of future war?"

4. Overpopulation, Freedom and Peace

Few Americans ever speculate much on the relationship between a country's population density and the kind of government it has. Born and brought up under democracy, we take that form of government pretty much for granted. If taxed for a reason as to *how* the United States happens to be a democracy, many of us probably would say it was due to the wisdom of the founding fathers who framed the Constitution.

But suppose the founding fathers, the Revolution won, had had to establish a system of government for a country containing 400 million people (as China and India do today), millions of whom were hungry most of the time. Would they have established a democracy?

The probability is that under such conditions no democratic form of government would or could have been founded. For history shows us again and again that democracy seldom flourishes in a nation where population has increased too rapidly in relation to its food supply.

Indeed, as we know it today, democracy is almost entirely a product of the New World—of regions where land, natural resources, and food have been plentiful and people relatively few.

"What about a country like England?" you may ask.

England seems to be an exception, but actually it is not. England has been a small part of a greater geographic group, the British Commonwealth and Empire. Countries like Canada, Australia, and the African dependencies have provided the food and

raw materials and the land to raise them which England has lacked—while British export industries have earned the foreign exchange to purchase them. Without such worldwide resources Britain could hardly be self-sufficient in its own little island, could not support 50 million people at their present standard of living, and could hardly retain the kind of democracy it now has.

In other parts of Europe one will find democratic countries where population growth is slow and has not outrun the food supply. Norway, Sweden, and Finland are examples. Two other countries, France and Holland, remain democracies although abnormal conditions brought on by the war severely reduced their supply of food. But Holland has had population control through state-approved birth control measures for years. France has had a stationary or declining population.

WHEN GERMANY TRIED DEMOCRACY

Germany, according to many population experts, is a nation with too many people which tried democracy and couldn't make it work. Overpopulation was, of course, not the sole reason for this failure; political, economic, and psychological factors played their part; but many observers believe that overpopulation was the basic factor, underlying all the others.

After World War I, you will remember, the Germans set up the Weimar Republic on the pattern of a democratic state. It endured as long as world economic conditions were relatively favorable. An important part of these conditions consisted of the loans Germany received from its former enemies, loans which not only enabled the Weimar Republic to pay reparations but also to import food from abroad. In the 1930's when this support was cut off, the republic had to go on its own. It soon encountered economic chaos, the basis of which, according to population experts, was the old problem of too many people, too little land, and not enough food. Germany's numbers between the Franco-Prussian War (1870) and World War I (1914) had increased

tremendously—from 41 million to 68 million—and what is technically called the "age group distribution" of the populace was such as to keep population piling up explosively for at least another generation. The result was that Germany emerged from World War I, despite war losses, with a basic problem of overpopulation. "Times" were bad; food, shelter, and clothing were not available in the quantities or qualities that Germans thought Germans should have. An outcry for *lebensraum* arose—more room in which to live, more land on which to grow food and the raw materials for other necessities of life. The democratic republic collapsed. A despot came to rule.

Look at the other nations where population has increased faster than food supply. Italy turned to dictatorship. So did Spain. The impoverished and overpopulated republics of Central and South America are called democracies but are in fact no such thing. Most of them are ruled by dictators. Japan and China have had anything but democratic government for centuries. Pearl Buck, the writer, who has observed overpopulation at work in China for years, sums up the matter:

"One of the chief causes for the increase in despotic theories of government is overpopulation. . . . In all those countries where population is too abundant the cause of the individual is lost."

It is probable, many population authorities think, that the number of democratic nations in the world may continue to decline—as long as there are more empty bellies in the world than there is food to fill them.

Democracy's star may not set, but its place in the sky will very likely be fixed over relatively uncrowded nations such as Canada, the United States, Australia, and New Zealand.

WILL AMERICA DECLINE?

On learning that the United States will probably never have more than 200 million people, some citizens of this country begin to worry. When told that a more likely peak is 165 to 185 million,

their concern increases. But tell them that the United States is fast approaching the year when its numbers will hit a descending curve, and they get up, many of them, and pace the floor.

"Then we are going into a decline," they will exclaim and go on to prophecies of disaster.

Their argument runs something like this: our strength depends on growth; the good times this country enjoyed were in the days when, as the result of a high birth rate and a high immigration rate, we were increasing our numbers by leaps and bounds; if we stop growing, we become weaker while others grow stronger.

Is all, or some, or none, of this reasoning correct?

It is true enough that the United States was economically robust in the days of most rapid population expansion. But many economists are positive that it does not follow that we must continue to expand rapidly for our best welfare. The proponents of arguments for expansion, they declare, forget that America was a very different country in the 1800's compared with today. Then we had the frontier and unlimited lands for everyone. Food and space were no problem, and our natural resources—mineral wealth, oil, timber—had scarcely been tapped. Under today's conditions continued rapid population growth, it is claimed, might not result in the blessings that the "big-population people" suppose.

There would be, for instance, an almost certain strain upon our natural resources. Remember the report of the Department of the Interior two years ago, warning that our mineral and forest wealth is being depleted? And does any American, after the winter of 1947, doubt that our oil deposits may be less than our needs?

HOW TO BE WELL-FED, WELL-CLOTHED, WELL-HOUSED?

This leads to another point which the big-population advocates have to consider: the question of the nation's well-being per

individual. Which is better, huge numbers with few of the world's comforts and goods, or a population where every citizen is well-fed, well-housed, well-clothed? And if you look about over the world, you will see that the peoples having the highest income per person—like the Swiss, Swedes, Norwegians, and Dutch—have a very low rate of population growth. In America the rate of population increase dropped more than one-half in the fifty years between 1880 and 1930; but in the same period the average American income soared from $424 to $1,655 per person. Which are wealthier in terms of individual well-being, the Hindus in their ever-increasing hordes, or the Swiss with their slow, almost imperceptibly rising numbers?

One population authority, P. K. Whelpton, of the Scripps Foundation, believes that the United States in terms of its own economic welfare is actually overpopulated right now. Instead of our present 148 million, or a future 180 or 200 million, it might be better, he believes, if we had a mere 100 million. At that figure the per capita wealth and the income per person of Americans would be higher than they are today.

"A stationary population," he declares, "has the advantage over a growing population in that it can put more emphasis on producing for itself and less on producing for the future, which should mean more consumption goods per capita and higher living standards. . . . If this nation could choose between having a stationary population of 131 million or 150 million or 100 million, it can be shown quite conclusively that the smaller number would be best from an economic standpoint."

THE LUCK OF THE IRISH

Skeptics who doubt that a lower or static population can bring economic betterment to a country are often advised to consider the present-day state of Ireland.

The Irish in 1840 in what is now Eire totalled 6.5 million inhabitants and were in an almost constant plight of hunger and impoverishment. Rapidly increasing numbers taxed ever more

severely the capacity of the land. Along came the great potato famine (1846) forcing thousands to emigrate or die.

Thousands left Ireland, and the population began to decline. A drop in the birth rate also set in. It dipped from 27 per thousand in 1870 to 23 per thousand in 1900. This was partly the result of late marriages. They became the style and the custom. By 1940 the number of Irishmen, percentagewise, who were *not* married was, in general, twice that of other nations. Records of the time reveal the United States with 39 per cent of males unmarried in the most highly reproductive age group (25 to 29) and the Irish unmarried males in the same age group, 80 per cent.

The effects on the population curve were spectacular. The total number of inhabitants dropped to three million, a cut of more than one-half. The effects on the welfare of the people were no less dramatic. From the poor house of Europe, Ireland emerged as one of the richest in per capita wealth and one of the best fed and clothed in the world.

Any disbelief on this latter score can probably be laid to rest by noting the surplus of foods which Eire was able to make available in 1945 for relief on the continent: 10 million pounds of canned meat; 2 million pounds of butter; 1.6 million pounds of bacon; 10 million tons of sugar; 50,000 pounds of knitting wool; 200,000 knitted undergarments; 100,000 blankets; 20,000 head of cattle.

BUT IN CASE OF WAR . . .

"Very well," say advocates of a big population for America, "but what about the military question? How will the United States stand up against fast-growing, big-number nations like Russia, China, India, in some future and not inconceivable war?"

This is the spectre of the Asiatic hordes—an idea inherited by Western peoples from the days when Genghis Khan and Tamerlane swept over and conquered parts of Europe.

But wars are not fought today as they were seven centuries ago. The sheer numbers of a nation and the size of its army are

no longer the chief decisive factors. What counts are natural resources, production facilities, material, and supplies. And material and supplies for modern war come from the surplus a nation can produce. What surplus can overpopulated countries like China and India, even if highly industrialized, furnish to a modern war machine? Such people can have *no* surplus because, even before war begins, there is nothing extra of anything.

According to one authority—Lowell M. Limpus in *Twentieth Century Warfare*—it cost Julius Caesar about 75 cents to kill a man. For Napoleon the cost was $3,000. Modern warfare has raised this figure tremendously. For World War II it has been estimated at $50,000 per dead soldier. These figures give an idea of the staggering quantities of surplus which any modern war demands.

And finally, in an atomic war the importance of mere numbers either in the fighting or on the home front will probably be less than ever before in history.

BUT RUSSIA . . .

Russia in this case warrants some consideration in detail. First, Russia's population situation can be analyzed in two diametrically opposed ways. One school of thought believes that the low living scale of the U.S.S.R. is due to industrial backwardness. The other school believes it is caused by population pressure and that Russia is already overpopulated and has been overcrowded, in terms of producible surpluses and land fit for agriculture, since long before the late war. One Russian expert, Dr. Vladimir P. Timoshenko, reports thus:

"After World War I (1914–1917) the migration of population to Asiatic regions became slower. The reserve of lands ready for settlement is now exhausted, and it is impossible to expect in the near future as large a movement from European to Asiatic territories as there was during the last decade before the war (World War I). Hence, if natural growth of population does not decrease, the process of overcrowding the countryside will

be inevitable in spite of industrialization. . . . At first it may seem surprising that the Russian Empire was, or that the U.S.S.R. is, an overpopulated country, while there are tremendous spaces of land only thinly populated. However, two facts have to be considered: first, a very large percentage of the population is occupied in agriculture; second, conditions in the greater part of Russia are unfavorable for agricultural activity."

But most authorities agree on one thing: if the Soviets continue their population growth at the present rate of about 38 births per year per thousand of the population (about twice the birth rate of the United States), Russia twenty-five years hence will probably have 250 million people. But then, Guy Irving Burch writes, in his provocative study *Human Breeding and Survival*:

"Russia's already low level of living may speedily approach Asiatic levels. Surpluses of goods from Russian production available for fighting wars will become less abundant than they were in World War II."

From this it would seem that we should not worry too much over Russian growth in mere numbers. The faster Soviet numbers expand, the less Russia is likely to have in the surpluses which are the sinews of modern war. Meanwhile, the United States, because of its nearly stationary population, can be expected to increase its strength, rather than lose it, in this respect.

"We have no need for a larger population with which to defend ourselves," says Frederick Osborn. "It is quite possible that our present population is the optimum size . . . providing every advantage of mass production, with an opportunity to conserve our resources over a long period of time."

And indeed, some of the population prophets declare that it is footless, in the case of Russia vis-a-vis the United States, for Americans to trouble about disparity of numbers, anyway. If victory in future wars is to depend on numbers, we won't have a chance. Russia, China, and India are all growing so fast that there is nothing we could ever do to catch up with them if we tried.

Any schoolboy can tell you that the whole cause of World War I was Kaiser Wilhelm of Germany. The Kaiser was possessed by a lust for power and the desire to give imperial Germany a "place in the sun."

Many of the population prophets have a different explanation. Their belief is that the root cause was Germany's rampaging birth rate. They go along with Dr. Louis I. Dublin, chief statistician and vice president of the Metropolitan Life Insurance Company.

"The World War (I)," Dublin declares, "was essentially an outgrowth of a pressing population problem. The peoples of Central Europe were overcrowded. The fears engendered in France and Russia by an ever-growing Germany contributed to a state of mind which made war inevitable. This is an outstanding example of an almost universal condition."

Nor do these population experts feel any differently about World War II. Same cause, same effect, they say. Germany was again in dire need of *lebensraum.* Its population density per square mile had doubled since 1875. Japan was in similar straits. And when a people in the midst of a movement of intense nationalism—which itself may be the result of their rising numbers—are told they must choose between starvation and a war of conquest, they are likely to pick Armageddon.

"Although wars may arise from a wide variety of causes," declare two students of the matter, Frank A. Pearson and Floyd A. Harper, of the New York State College of Agriculture, Cornell University, "such as the ambitions of ruling classes, religious differences, and the like, most of them arise from actual or imagined economic differences. Hitler stated the fundamental cause of war very simply and clearly—more *lebensraum.* Since there are so few of the good things of life and they are so unevenly distributed, there is plenty of incentive to attempt to redistribute them. Past history does not indicate that this equality will be established by voluntary or peaceful methods. It is more likely

that the stronger groups of men will seize, or attempt to seize, fertile valleys, plains, or countries from their weaker neighbors, if they feel that they do not have adequate food supplies. World Wars I and II were attempts at redistribution, and, as the pressure of population on the food supply increases, there will be more. The more integrated and interdependent the relationships between continents become, the more likely it is that trouble will arise."

Of course, the population experts are not alone in attempting to find the causes of war. Historians, political scientists, psychologists, and others have studied the problem and have stressed other factors which have led men to fight. It is perhaps impossible to predict that a nation with teeming millions will go to war tomorrow or the next day. But it is important to understand how often overpopulation *underlies* warlike political movements, psychological attitudes, and economic conditions.

Even in ancient times when the world's population was much lower than it is today, this underlying cause played its part. Some experts attribute the Roman conquests to the fact that the Italy of that era could no longer supply adequate food. The Roman legions pushed abroad, conquering North Africa, Egypt, Mesopotamia—the "bread basket" of the Mediterranean world. Previously, the Greeks, when their numbers outran the food-producing capacity of their homeland, did the same. The pattern—more people, less food, equals war—has recurred again and again in history.

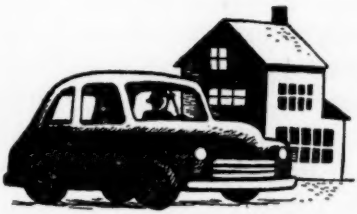
MIGRATION AS A POSSIBLE CURE

One way to eliminate the pattern, some folk think, is to thin out the densely settled sections of the earth. People from these regions would be induced or allowed to emigrate to the so-called empty spaces, like Canada, Australia, South America. Wouldn't it be better to take Australia away from the unwilling Australians than to risk another war? And let the United States open its own gates. We still have some room left here.

THE WORLD'S FUTURE?

MODERATE POPULATION

OVERPOPULATION



ECONOMIC WELL-BEING

POVERTY

PEACE, DEMOCRACY

DICTATORS AND WAR

GRAPHIC ASSOCIATES

It is reasoned that thereby population pressures in the danger spots would be relieved. The countries of origin, then with fewer mouths to feed, would have no cause to embark on land-grabbing conquests.

Although plausible, this scheme, on trial, has always proved disappointing. Curiously, experience shows that emigration seldom solves a people's population dilemma. Our own Benjamin Franklin observed this.

"You will not have fewer at home for those who go abroad," he wrote. "Emigration does not diminish but multiplies a nation."

One of the classic proofs is Italy. From 1880 to 1910 Italy exported millions of citizens to North and South America. Overcrowding in the homeland, you might think, was thereby lessened. But such was not the case. Actually population pressures there increased. Why? Because suddenly there was more food per capita, which is conducive to an increase in the birth rate. So Italy, ironically, found that during the greatest exodus in its history it had annually increased its population and at a faster rate than before. By 1910 Italy actually had *more* people and was *more* crowded than when the mass emigration began.

The exception to this tendency is Ireland, mentioned before. But the Irish, while sending surplus people overseas, began also to control population growth by an almost spontaneous practice of later marriages. No other overcrowded people of any consequence have done the same.

POPULATION CONTROL—MAN'S LAST HOPE?

But suppose the whole world were to do what Ireland did—deliberately check its own population increase. If man cannot balance the people-versus-food equation in the years ahead, would it not make sense for him to try to limit the number of hungry mouths?

Many population prophets think that it would make sense and that probably this course of action is man's best card.

As to the best way to play the card—the surest and most effective—they, however, disagree.

"By urbanization," one insists. More people are to work and live in cities—which always reduces the birth rate. Get the Hindu peasant and his like away from the country village, and the social ideal of the big family will decline.

Says another: "Top priority goes to creation of better economic conditions." These raise the standard of living, bring more material wants, a tendency toward smaller families to share the breadwinner's income, and thus fewer children.

"The first great population curb will be industrialization," is another cry.

But industrialization, some experts contend, *can* be the breeding ground of more people and more wars. Look at Japan which became highly industrialized in seventy-five years. Previously the Japanese had had a static population for centuries. Industrialization resulted in a rapidly increasing population; industry and trade were not used to raise the living level of the individual Japanese to something like Western standards. Result: that old cause of war, the unbalanced equation, appeared.

BIRTH CONTROL AS POPULATION CONTROL

And finally, you will hear many population experts declare that the only possible cure for man's runaway population growth is birth control. By this is meant, of course, not the birth control of primitive peoples, like abortion and infanticide, but limitation of the size of the family by voluntary, scientific contraception.

"The time must come before long," states Warren Thompson of the Scripps Foundation for Population Research, "when the population of the earth must practically cease to increase, and it now appears that birth control is the method by which this will be brought about."

It sounds like a simple matter, but actually it is not. The difficulties ahead for birth control are practically limitless.

In the first place, widespread practice of birth control must overcome the moral and religious prejudices of millions. In the West, despite the fact that the world's population was static for centuries, many folk still sincerely believe that rapidly increasing numbers are a law of both nature and God. They know that the Bible admonished, "Be fruitful and multiply," but have not heard that it wrothfully chided, "Thou hast multiplied the nation and not increased the joy." And among the peoples of the East, birth control will clash with cultures in which the very act of procreation is a sacrament and children a guarantee of the soul's welfare in after life. Its progress there will surely be discouragingly slow.

Secondly, scientific conception control is not yet adaptable to the great mass of human beings. Its practice requires a modicum of knowledge, technique, and even social aspiration, which the lowliest, poorest, and most ignorant of the world's millions are not capable of achieving.

TOO LITTLE TIME?

This brings us to what is perhaps the most ominous question of all: whether any method of population control—or even all possible methods together—can accomplish enough in time, with the world growing at the rate of 200 million every decade, to be really worthwhile.

Should man, perhaps, enjoy the solace of fatalism and let pestilence, malnutrition, famine, and war themselves balance the equation?

There are optimists among the prophets of population, and they think that man should take up the challenge. They believe that if he will, there is hope for the future. They foresee a time when by our own deliberate efforts, it may be possible to keep the world's population at a fixed, optimum level, and through advances in agriculture, in balance with the world's food supply.

This would be brought about by a world population control program, set up, promoted and administered by some agency like the United Nations. The plan would be "put over" by mass propa-

ganda methods in all important countries, using all possible media—radio, moving pictures, the printed word. The goal, according to one population authority's calculations, would probably be a stationary population in the neighborhood of two billion people.

If such a plan could be launched and carried out successfully, it is believed that within fifty years the total of man's numbers would be dropping 10 per cent every thirty years, and that by the year 2100 the static population goal of two billion would appear.

A long wait, one may say. But considering population's present rate of growth, any earlier goal is probably illusory.

"During the coming half century," the Population Reference Bureau has pointed out, "even with an effective world program of population control, the inhabitants of the world can hardly increase less than 550 million."

But can the races of man, with all their differences in creeds, ethics, mores, customs and cultures, prejudices and principles, ever be brought to believe in such a plan and to back it?

Some of the population prophets (but not all) will answer you in the affirmative. In the judgment of one of the soundest and wisest, Warren Thompson of the Scripps Foundation, it is highly improbable that any people on earth will not appreciate the advantages of such a program when they have had a chance to learn about it.

All of us can only hope that this prediction proves correct. Should it *not*, one thing seems pretty certain. The world will have no freedom from either want or war for a very long time to come.

Food and Diplomacy

by Blair Bolles

The chestnut is my life
—A Sicilian farmer to his American guest

Whoever has walked through western Sicily or along the valley of the Po River in northern Italy has seen the chestnut trees. There are two million of them. They shade the land like great parasols and provide the people with a rich food. The nuts give starch, fats, and vitamins. When the cook mixes the big ones, marrons, into sweet potatoes, you have a dish you won't soon forget. Cattle feed on them, and Italy exports them—13 million pounds a year to the United States. The chestnut is one of the foundations of Italy's economy and diet.

In the spring of 1946 these fine trees began to die. An infection had attacked the bark. A few years earlier such a blight would have left the Italians helpless. After World War I the same fungus disease, *Endothia parasitica,* killed the chestnut trees in the eastern United States, and there was nothing to be done about it. But today it's different. Italy sent a horticultural SOS to the United Nations Food and Agriculture Organization in Washington. It responded by gathering together the chestnut knowledge of the world for Italy's benefit.

The dying trees themselves were beyond saving. But in their place could be planted blight-resistant trees, which were known to grow in China and were believed to grow in the Spanish Basque country. The FAO dispatched forty pounds of Chinese chestnut seed to Italy by air and sent two Italian botanists, Aldo Pavari and

Antonio Biraghi, to Spain to collect seeds and cuttings. Along the Po new chestnuts are now growing where the old ones stood.

The readiness of the United States, China, Spain and Italy to unite themselves temporarily in a chestnut alliance is a phenomenon of our time. Since the middle of World War II, great and small countries have been cooperating consciously and methodically to increase the production of food, in what may be called the world's new "Nutrition Era." Nations now assume that hunger anywhere can harm mankind everywhere.

Governments worked together on food matters in the past, but their collaboration was severely limited. It consisted of gathering statistics, as in the work of the International Institute of Agriculture in Rome; of sending supplies abroad on a sort of soup-kitchen basis to starving peoples in time of famine, like American relief for Armenia; and of making agreements to limit trade in a few commodities such as sugar.

The idea behind modern cooperation is that mankind must raise food for all—no matter how big a number "all" becomes. The sponsors of these new undertakings disagree with Malthus, the pessimist who put a ceiling on the number of people the earth could support and the amount of food it could grow.

"Production of food must be greatly expanded. We now have knowledge of the means by which this can be done," says the final act of the Food and Agriculture Conference which met in Hot Springs, Virginia, in May 1943. That conference marks the starting point of the modern adventure in international cooperation aimed at enabling people to eat their fill.

However, the cooperative organizations have already discovered that even nations where undernourishment is common sometimes reject the knowledge which shows the way to improvement. Novel advice, scientific techniques, and modern practices are in constant conflict with ancient customs.

Can an international agency like the Food and Agriculture Organization persuade, cajole, or compel any single nation to take the action that would mean more food for the inhabitants of that

nation? By looking at the brief but interesting history of the institutions and programs which governments have created since the beginning of the Nutrition Era, we find evidence for both "yea" and "nay" answers to this question.

AGENCIES OF INTERNATIONAL COOPERATION

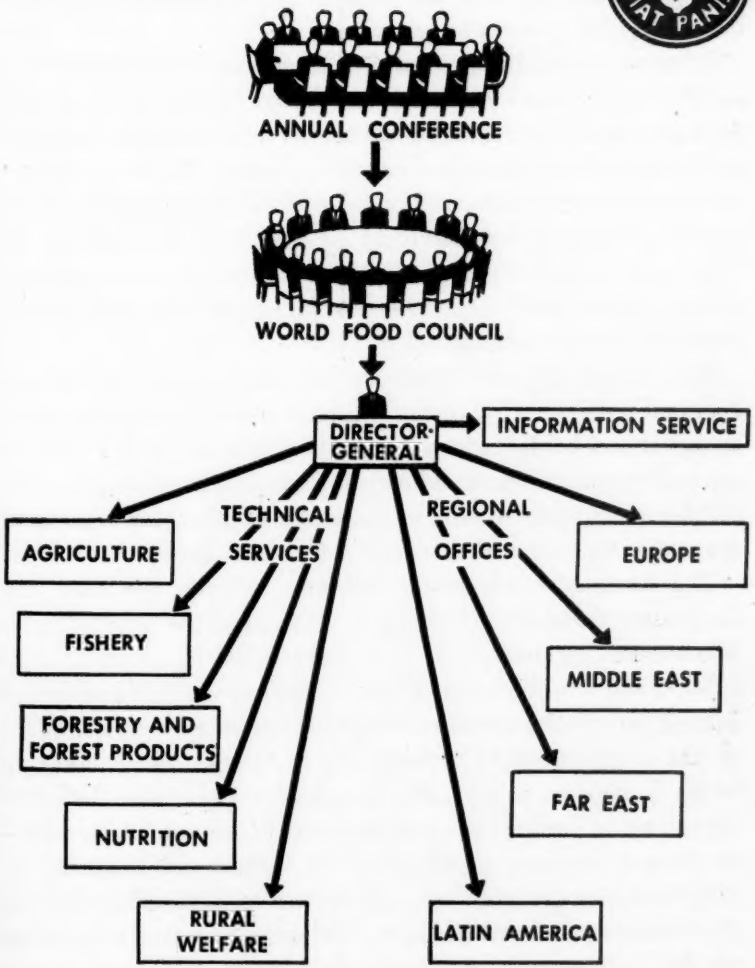
The beginning of the methodical attempt by governments to increase the supplies of food in the world by their joint efforts took place in Atlantic City, New Jersey. There in November 1943 the representatives of forty-four countries met in a conference which led to the establishment of the United Nations Relief and Rehabilitation Administration.

During the three years of its existence UNRRA distributed seeds in China and Eastern Europe, sent agricultural experts to teach beneficiary countries how to till the land more efficiently, distributed tractors and other agricultural machinery, sent fertilizers to countries which otherwise could not obtain them, and made gifts of food. UNRRA was essentially a wartime agency, and its energy was spent mainly on immediate, emergency problems. But even in the midst of battle it laid the groundwork for long-term improvement of farming practices and nutritional habits.

Drawing on this wartime experience, governments now maintain a number of specialized international agencies interested in stimulating the output of food. The most important of these agencies is the FAO. It was established as a going concern on November 1, 1945, two and a half years after the food meeting at Hot Springs. The main purpose of the FAO is to raise the world level of nutrition at the same time that it improves the living conditions of the food-raisers—the farmers and peasants. It has fifty-seven members, but it has no authority to direct any of the members to follow any course of action. It works along three main lines:

1. It offers technical assistance to member governments, to help them produce more food, fibers, and timber.
2. It promotes concerted international action by recommending

FOOD AND AGRICULTURAL ORGANIZATION



GRAPHIC ASSOCIATES

definite ways and means for putting the latest facts and scientific methods to use.

3. It gathers the basic facts on the ever-changing food and agriculture situation to enable member governments to formulate their own food production plans.

Other organizations have undertaken similar tasks. Considering nutrition as a basis of culture, the United Nations Educational, Scientific, and Cultural Organization, set up in Paris in 1946, has encouraged South American countries in the Amazon basin to clear the Hylean Amazon region for cultivation. UNESCO held a special conference last spring at Iquitos, Peru, to establish an International Institute of the Hylean Amazon. Some agricultural specialists are skeptical of the possibilities of this project, but UNESCO has not abandoned it.

The United Nations Economic Commission for Europe cooperated with the FAO in the winter of 1948 by assigning three transport and refrigeration experts the job of drafting a plan to expand the quick-freeze industry in Europe and to increase the number of refrigerated railway cars and trucks in order to improve the movement of perishable foodstuffs across Europe.

The Economic Commission for Asia and the Far East, the Caribbean Commission, set up in 1943, and the South Pacific Commission, established in 1947, have authority to study agricultural and food problems arising in their areas. The Institute of Inter-American Affairs, a surviving portion of the wartime Office of the Coordinator of Inter-American Affairs, is encouraging better farming in a few Latin American regions, and the Interdepartmental Committee on Scientific and Cultural Cooperation—an American agency—supplements the work of the Institute.

Special inter-governmental conferences on food and agriculture problems have become common. The Inter-American Conference on the Conservation of Renewable Natural Resources met in Denver in September 1948, two months after an FAO Latin American Nutrition Conference in Montevideo, Uruguay. Through the encouragement of the FAO, representatives of the United

States, Britain, Australia, Burma, China, France, India, the Netherlands, Pakistan, the Philippines, and Siam gathered at Baguio, Philippines, early in 1948 and agreed to establish the Indo-Pacific Fisheries Council, for the conservation of seafood in Southeast Asian waters.

To raise the production of rice—which is the basic food of nearly one-half the population of the world—the FAO called another conference at Baguio a month later. The meeting approved a plan for expanding the rice areas of Asia and other continents. The plan would operate under an International Rice Council—empowered, like the FAO, to make recommendations but not to enforce them. The rice crisis leading up to the Baguio recommendation has developed in two stages. Between world wars the rice-eating population increased 20 per cent while the production of rice increased 10 per cent. During the recent war the production fell off sharply, and it has not yet been restored.

The FAO conducted an International Timber Conference in Czechoslovakia in 1947 and a similar conference in Latin America in 1948. These conferences were held in the belief, stated by the FAO forestry magazine, *Unasylva,* that the forests of the world are "inherently capable of yielding more bountiful supplies of their products in the years to come" if they are wisely managed.

HOW TO ASSURE FOOD FOR ALL

Officials in the inter-governmental agencies cite past experience as a solid reason for their confidence that food production can be increased to feed larger populations.

One source of encouragement is the wonderful fecundity of hybrid corn. Since American farmers began to substitute it for the old-fashioned cross-pollinated corn fifteen years ago, a field which once produced a crop that would feed ten people now feeds twelve. Two years ago Dr. Luigi Fenaroli, a botanist from the experimental station in Bergamo, Italy, strolled among the tall corn rows in Iowa. Impressed, he took back to Italy samples of hybrid seed and planted them in different parts of his native land. He got

better results than the Iowa farmer, whose hybrid yield is 20 per cent above that of ordinary corn. At Brembio, Fenaroli's hybrid outproduced the old-fashioned corn by 117 per cent; at Aquileja by 54 per cent; at Savigliano by 36 per cent; and at Bergamo by 32 per cent.

Europeans, excited by Fenaroli's success, attended a school in hybrid cultivation which the FAO conducted at Bergamo in 1947. Last year the following European countries harvested hybrid corn crops: Austria, Czechoslovakia, France, Greece, Hungary, Italy, the Netherlands, Norway, Poland, Portugal, Switzerland and Yugoslavia.

Mankind can also add to the acreage available for crops. By irrigation the United States has reclaimed much of its western desert land. Orange trees bloom near Tel Aviv in Israel on what not long ago was barren land. Speakers at the FAO regional conference for the Near East in February 1948 said that their part of the world could bring new areas under production by using water from deep wells. The United States Agriculture Department had sent a mission to one of the countries represented at the Cairo conference—Saudi Arabia—with resulting improvement in the yield of date palms.

International agricultural planners say that if clothing manufacturers will take to the woods in even greater numbers than they are doing now, vast acreages devoted to raising plant and animal fibers, especially cotton and wool, can be turned over to food plants. Chemists and industrialists are constantly improving processes for extracting textile fibers from wood in order to exploit unused forests and accelerate the shift from cotton and wool to cellulose cloth.

The British peanut project for East Africa is the most spectacular recent effort to put untouched country to fruitful use. Peanuts are a rich source of oil, and until World War II the United Kingdom bought many peanuts—the British call them groundnuts—in India. But, acting on the contemporary Asiatic tendency to "look homeward, angel," India after the war kept the peanuts for

its own use. So in 1946 the British government decided African peanuts should replace those from India. Since Africa was not growing peanuts in sufficient quantities, Britain marked off an area of 3,250,000 acres of formerly fallow land and began to clear it for peanut cultivation.

Furthermore, people can put the food available to better use if the millers and cooks in the world are careful. The most nutritious parts of rice are frequently wasted at the mill, in the sink, and over the fire. Of the miller, the FAO rice meeting in Baguio reported: "As a result of the war, a large proportion of mills are in a worn-out state. . . . The processing of rice in such mills leads to extensive losses of human food." The milled rice loses more food value when it is washed before cooking and still more if the cook boils the rice with too much water and throws the water away. Steaming preserves the food value of rice better than boiling.

SUCCESS IN INTERNATIONAL COOPERATION

Sovereign governments have often accepted the recommendations of the inter-governmental agencies.

At Tingo Maria in the Andes in Peru the traveler can find a community of farmers, immigrants from other Peruvian areas, who thrive under international guidance in a region that was almost unpopulated a few years ago. To improve their lot, the United States and Peru, working together through the Inter-American Institute, operate an agricultural station, and American and Peruvian technicians man sixty-seven projects for the betterment of plant and animal stocks, husbandry, and processing practices which can result in more efficient farm production.

To attack a major cause of famine in thickly populated China, the FAO assisted the Chinese Ministry of Agriculture to reduce the serious cattle disease of rinderpest by vaccination south of the Yangtze River in 1948. Rinderpest each year has killed one million Chinese water buffaloes, on which Chinese farmers depend to till their rice fields. When buffaloes are scarce, rice is scarce too.

The FAO helped the Polish Veterinary Department organize a

campaign to stamp out cattle tuberculosis in Lodz and also assisted Poles in testing a vaccine against hog cholera. An FAO forestry specialist spent more than a year in Italy helping the government develop programs for the improvement of forests.

DISAPPOINTMENTS IN COOPERATION

But inter-governmental cooperation so far has been a slow train for the long journey toward basic improvement in the world food problem. Governments shut their ears to many recommendations which call for fundamental economic or political changes. The FAO missions to Greece in 1946 urged the government in Athens to reduce its military budget—so it could spend more on public welfare—just before Greece began to devote more drachma to the army than it ever had in history. The FAO mission to Poland in 1947 called for a divorce of scientific and cultural activities from "all commercial, political, and other biases" at a moment when the authoritarian Polish government was tightening its controls over the educational system.

The FAO tried to solve essential issues of the food problem with a program proposed by its then director general, Sir John Boyd Orr, at the conference in Copenhagen in September 1946. Sir John urged the world to set up a food board with the power to stabilize prices of agricultural commodities on the world markets, to establish a world food reserve adequate for any emergency, to provide funds for financing the disposal of surplus agricultural products, and to cooperate with organizations providing international credits for industrial and agricultural development.

The member countries of the FAO voted down the Orr proposal, which in their opinion encroached on existing concepts of sovereignty and of free enterprise. Since then the inter-governmental agencies have been able to tackle specific food problems, but they are still drastically limited in any over-all approach aimed at making the whole world a more bountiful place in which to eat.

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